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SYSTEMATIC OVERESTIMATION OF BENEFITS IN APPRAISALS FOR ROAD CAPACITY EXPANSIONS

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Abstract

Although the phenomenon of induced traffic has been theorized for more than 60 years, the traffic-generating effects of road capacity expansion are still often neglected in transport modeling. Such omission can lead to serious bias in the assessments of environmental impacts as well as the economic viability of road projects in urban areas. This has been illustrated in the present paper by a comparison of environmental and economic appraisals for a proposed road project in Copenhagen with and without short-term induced traffic included in modeling. Even though only short-term effects were included, the comparison showed substantial differences in project feasibility. Induced demand resulted in lower travel time savings, more adverse environmental impacts and a considerably lower benefit-cost ratio when induced traffic is partly accounted for than when it is ignored. Omission of induced traffic can result in over-allocation of public money on road construction and correspondingly less focus on other ways of dealing with congestion and environmental problems in urban areas.

1. Introduction

The aim of the present paper is to illustrate how common appraisal techniques can be, and often are, depicting benefits and drawbacks of proposed transport infrastructure investments in a distorted way. Cost-benefit analysis (CBA) is typically the most common form of appraisal technique for such projects (Mackie 2010; Odgaard, Kelly, and Laird, 2005).

For road projects, the accuracy of traffic forecasts are crucial to the validity of subsequent impact assessments. These forecasts form the basis for estimates for a wide range of impact factors, including time savings, emissions, and noise. Since several studies have concluded that traffic demand for road projects are on average underestimated (Flyvbjerg, Bruzelius and Rothengatter, 2003; Holm 2000; Parthasarathi and Levinson, 2010; Welde and Odeck, 2011), one might assume that this would cause benefits to be underestimated as well. However, underestimating the demand for road traffic also means that the expected time

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saving benefits might not materialize due to additional traffic, since demand could become so high on the new infrastructure that congestion occurs. It is this latter effect that will be the focus of the present article (see Næss, Nicolaisen and Strand, 2012 for a more extensive discussion).

Model simulations of a road project in Copenhagen with and without inclusion of induced traffic is a main source of evidence. In addition, similar, but less in-depth simulations have been carried out for the network of major roads in Greater Oslo, as well as for a planned motorway in a less congested part of Copenhagen Metropolitan area. The empirical context of the paper is the Scandinavian countries, particularly Denmark, but we think the conclusion are relevant also in a wider international context insofar as induced traffic is not fully taken into account in transport modeling practice.

2. The effect of induced traffic

Omission of induced traffic could be a possible explanation why traffic demand for road projects appears to be systematically underestimated. Road improvement generally tends to increase overall traffic volumes due to lower cost of traffic in the form of less time spent to reach a given destination. The effect of induced traffic is now widely accepted among transport researchers (American Association of State Highway Officials, 1957; Downs, 1962; Goodwin, 1996; - Mogridge, 1990; Nicolaisen and Næss, 2011; Noland and Lem, 2002; Næss, Mogridge, and Sandberg, 2001; Overgaard, 1966; SACTRA, 1994; Thomson, 1977). In line with theories of transport economics and transport geography, and a number of empirical investigations in various countries, road development facilitating higher traffic speeds will result in generated and induced traffic by influencing the following six parameters:

1. Route choice
2. Peak hour traffic
3. Modal split
4. Overall transport volume
5. Land use (long-term)
6. Quality of public transport services (long-term)

Among these six effects, the four latter contribute to genuinely induced traffic (i.e. additional vehicle kilometres), whereas the two former contribute to relocation of existing traffic in time (e.g. between the rush-hour and other times of the day) and space (e.g. between different routes in the same transport corridor). To avoid confusion we do not refer to changes in the temporal or spatial distribution when using the term induced traffic, but are mainly concerned with the effects of parameters 3-6 in the case presented here. In the discussion in section 5 we shall, however, cover parameters 1 and 2 as well.

For road projects, the effect of induced traffic implies that traffic demand exceeds forecasts if these do not take this effect into account (or traffic is overestimated in the no-build alternative, see Næss (2011) for a discussion of this). One interpretation of this could be that more drivers benefit from the new capacity, and that the latent demand means the infrastructure investment has been more feasible than expected. However, more traffic also causes higher environmental stress in the affected area, and if the traffic volume becomes large enough to have a detrimental effect on flow, there is also a loss of time saving benefits. The short-term effect of this is problematic for the situation immediately after the new capacity is opened, but the long-term effect from changes in land use, car ownership, and commute patterns are even more severe. It is possible to include the short-term effect of induced traffic in models, but often this is not done (Johnston and Ceerla, 1996; MOTOS, 2007; Nielsen and Fosgerau, 2005; Næss, 2011). Long-term effects are even more problematic to include, due to the inherent uncertainty associated with estimation of parameters that are dependent on a wide range of unknown factors.

In Denmark, only very few transport models currently in use take induced traffic into consideration. According to Nielsen and Fosgerau (2005), induced traffic has usually been underestimated or totally ignored in the forecasts made as preparation for decisions about larger Danish road projects in the past decades. The only exception is the so-called Ørestadens Trafik Model (OTM), which was originally developed to assess the demand for the Copenhagen metro project, opened in 2002. For most of the modeling work undertaken in Denmark in this period, induced traffic has thus usually been disregarded. According to the responsible parties in the Danish Road Directorate, the regional transport models have during the most recent years been adapted to account for induced traffic (UNITE, 2011a).

However, these model features are not always used in practice. For example, in a recent analysis of the impacts of adding motorway capacity to an existing bridge, a model that did not account for induced traffic was preferred over one that did, in spite of the latter being available[4]. The argument for not doing so seems to be a feeling that induced traffic does not cause significant growth in traffic, and that the effect on the CBA would be negligible even if it was taken into account. In a recent report by a government appointed commission on the need for future development of transport infrastructure in Denmark, the effect of congestion as a deterrent against further traffic growth in a given road network was disregarded in the transport model calculations (Danish National Infrastructure Commission, 2008). Traffic was therefore assumed to grow at a fixed rate, even in situations where driving speeds were predicted to be significantly reduced due to congestion. The identical traffic growth forecasts with and without capacity increases result in exaggerated assessments of the

[4] (interview with HNJ, September 2010)

amount of congestion in the absence of new road construction. Since this document now serves as a reference for appraisal of transport infrastructure projects, such bias in the underlying assumptions distorts the entire appraisal system, and thus also the validity of any results it produces.
Neglect of induced traffic appears to be commonplace in other European countries too. According to the European MOTOS handbook on transport project evaluation, many transport models used in practice do not adequately account for induced traffic, and use of fixed matrices have traditionally been quite common (MOTOS 2007). This is also confirmed by preliminary results from a survey carried out as part of the same research project as the present paper. Among 48 respondents experienced with Swedish transport models, 67 % stated that they completely or partly agreed in the statement that transport models are poor at forecasting the effects of induced traffic. In Denmark and Norway, the corresponding shares were 52% and 48%, respectively (UNITE, 2011).

Figure 1 is adapted from Litman (2011), and illustrates how expected travel speeds are systematically overestimated when induced traffic is ignored. It is this effect that causes a distorted assessment of benefits in CBAs for road capacity expansion.

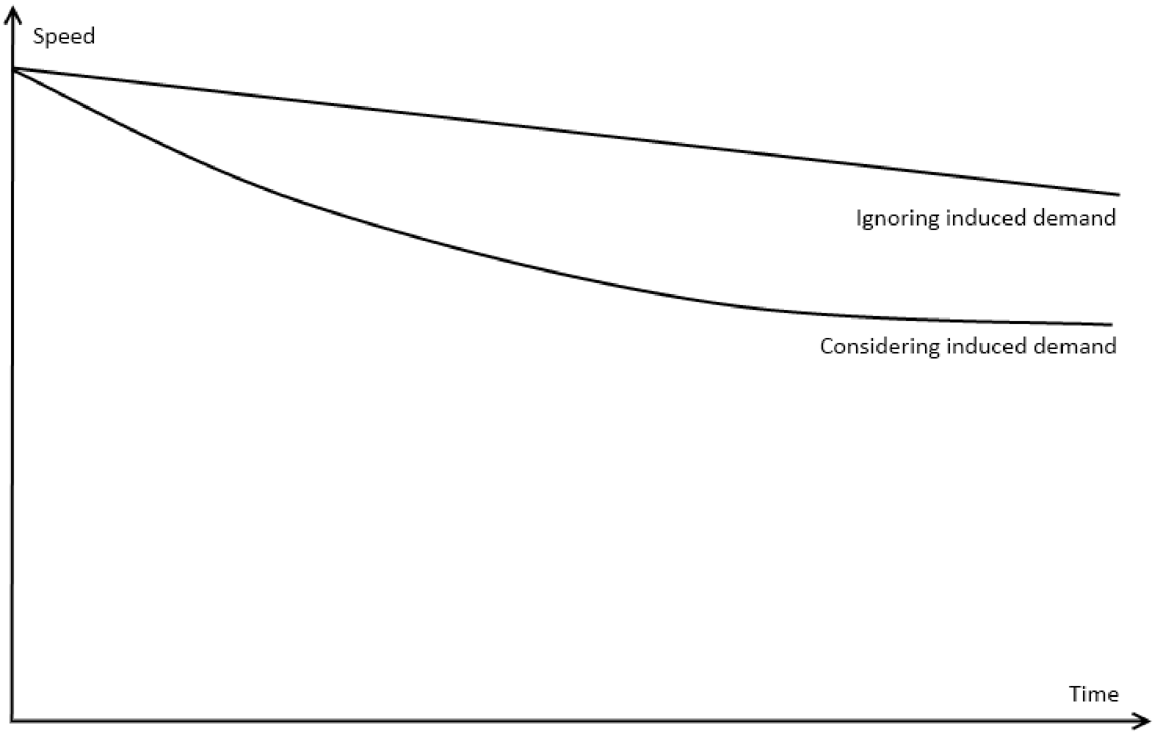

Figure 1. Projected Average Future Traffic Speeds, Depending on whether or not Induced Traffic has been Included in the Forecasting Model. Adapted from Litman (2011, p. 18).

The magnitude of induced traffic can be illustrated through the results of a model simulation for Greater Oslo in Norway. The transport model applied until recently for this region, FREDRIK, offered the opportunity of including induced traffic as well as omitting it. As part of a transport study for the Oslo Region, the need for additional road lanes resulting from a requirement for free-flowing traffic (i.e. no congestion) in a future 2030 situation was illustrated. A simulation specifically made as input for the present paper was made with and without induced traffic taken into consideration. As shown in Figure 2, the estimated need for additional lanes is considerably higher when induced traffic is taken into consideration than in the simulation where induced traffic is ignored. The difference between the simulations with and without induced traffic varies from none to six additional lanes, depending on the position of the road in the entire road network.

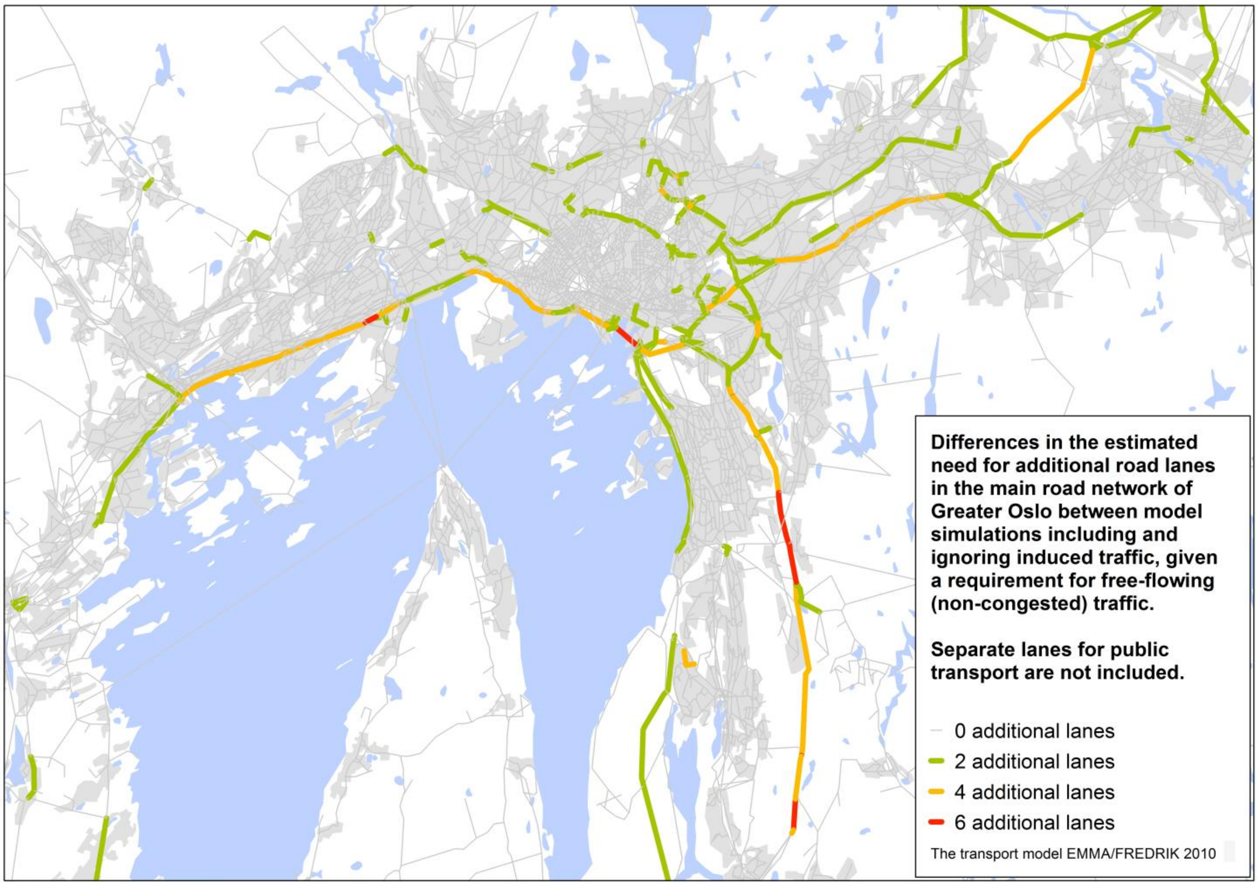

Figure 2. Differences in the Estimated Need for Additional Road Lanes in the Main Road Network of Greater Oslo between Model Simulations Including and Ignoring Induced Traffic, Given a Requirement for Free-Flowing (Non-Congested) Traffic. Source: Simulation made specifically for this article, carried out by Andersen (2011).

Nielsen and Fosgerau (2005) illustrate how the effect can be problematic for assessment of time saving benefits, especially in the form of CBAs. Figure 3 is adopted from their work, and illustrates the supply curves with and without new capacity (do nothing vs. do something). As new capacity is introduced on the network the cost (time) of traffic decreases, and the equilibrium moves from X to Y, which causes an increase in traffic volumes in the short term. An approximation of travel time savings would in this case be the total area A+B. However, if we do not take the effect of induced traffic into account we end up with the approximation A+C instead, clearly a much larger estimate.

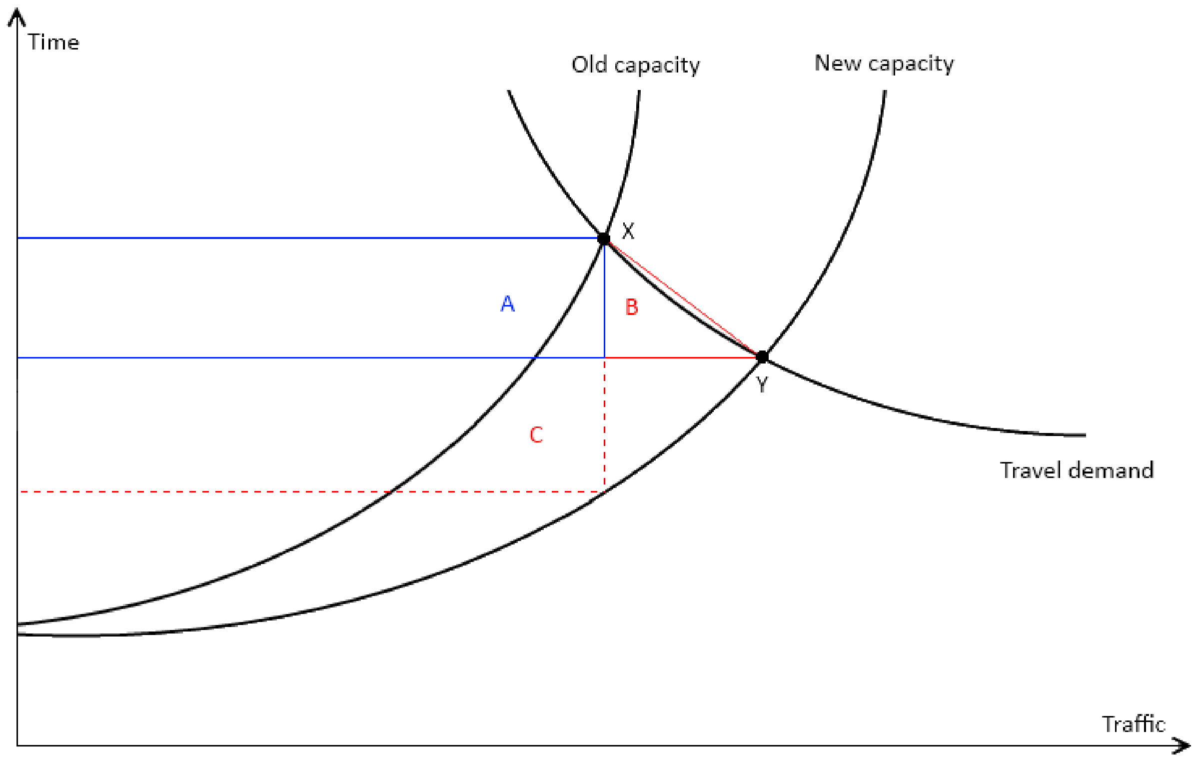

Figure 3. Example of Supply and Demand Curves and Time-Benefit Calculations for a Road Before and After Capacity Increase. Adapted from Nielsen and Fosgerau (2005, p. 10).

It is important to observe that if initial demand is low (i.e. no congestion at X) this effect likely underestimates benefits in the form of travel time savings, as additional drivers would enjoy the benefits without increasing the cost of traffic in any significant way. A Danish example of this could be the new motorways constructed in the northernmost part of Jutland in the years before and after 2000. In such cases the improved road standard usually does not release a large amount of latent demand, and the additional traffic induced by higher speed limits etc. will not be sufficiently great to raise the traffic volume to a level where congestion arises. There are, however, also situations where traffic volumes are high enough that new road capacity can release some demand, but not sufficient to cause immediate congestion problems on the new and expanded road. In such situations, the time savings for new drivers may exceed the increased travel times among existing drivers caused by induced traffic. In addition to our main case example, we will briefly illustrate such a situation in Section 4, Results. Our main case will, however, be a new road constructed to improve traffic flows in a highly congested urban context. Since capacity expansion is often a measure employed to reduce congestion in areas where this is already a problem or expected to be so in the near future, we consider it highly relevant to illuminate such a situation.

3. The applied methods in the case example

In order to illustrate how neglect of induced traffic can lead to overestimation of benefits we have chosen to perform two appraisals for a selected Danish road project in a congested transport corridor; one which includes induced traffic (model A), and one which does not (model B). The results will then be compared to see whether inclusion of induced traffic in the transport model will result in a reduction of estimated benefits in a CBA. In order to make the results as representative of a typical appraisal as possible, we have chosen to use a recent road project proposal as our case.

All calculations were performed by the agency that typically handles these tasks in the case area, in order to ensure that the appraisals are as true to standard practice as possible. The consultancy firm Tetraplan was thus hired to do the appraisal. The proposed road link was evaluated using current standards for unit prices set by the Danish Ministry of transport. The appraisals with as well as without induced traffic include most of the impact factors included in a standard CBA. However, several effects that could influence the CBA results were excluded due to resource constraints, such as impacts on public transport services or disruptions during construction. However, as construction costs and travel time savings make up the vast majority of total costs and benefits in the CBA for a typical transport project, we doubt that the exclusion of some of the minor effects can have resulted in any substantial misrepresentation of the appraisals presented in the present article. The consequence in the present appraisal is a slight underestimation of costs, which is reflected in higher net present values for both models than would otherwise be the case.

In the chosen case the OTM model (version 5.2) has been used for this purpose, as it is the only model used in practice in Denmark that has the ability to model induced traffic to the extent necessary for this study. It is a state-of-the-art tour-based demand model at the tactical/operational level, and has several sub-models for predicting the traffic demand for different traffic modes based on different traffic purposes. It should be noted here that the OTM model only models the short-term effects of induced traffic, and the results should therefore be considered highly conservative estimates of the impact of including vs. ignoring induced traffic on appraisal results. The standard OTM model will represent model A. A modified version, which performs like the simpler models typically used in practice, will represent model B. For details on the differences between the two models we refer to Tetraplan (2011a).

The selected case is Nordhavnsvej, which is a planned road project in the northern part of Copenhagen (see figure 4). The new road is intended as congestion relief for the dense residential streets in the nearby Østerbro area just south of the new route. This is argued to be a consequence of comprehensive plans for new urban development in the Nordhavn area just east of the new route, which is expected to house 80,000 new residents and jobs (Municipality of Copenhagen, 2009). These plans are of course expected to increase traffic demand significantly, and the case seems well suited to illustrate the effect of induced traffic on appraisal results for a capacity expansion on a congested network. The current plans for the road involve a new urban link of 1650 meters, with two lanes in each direction and a speed limit of 60 km/h. About 620 meters will be done as a cut-and-cover tunnel, with open ramps in each end. It is expected to reduce traffic in the Østerbro area with 15 % and is set to open in 2015.

Figure 4. The Proposed New Nordhavnsvej Link in Copenhagen. Legend: Black line: surface road; black dotted line: road tunnel; blue line: surface ramps. Source: Municipality of Copenhagen (2011).

In addition to the full case study we have, as mentioned earlier, also made simulation of a road project on a network with little congestion. The extent of this appraisal was more limited than for the full case study, as only first year benefits were calculated. The purpose of this additional study was mainly to confirm that the induced traffic effect is less important to the CBA results under conditions of low congestion, which also turned out to be the case. More information on this appraisal can be found in Tetraplan (2011b).

4. Results

The overall findings of the Nordhavnsvej case are summarized in Table 1. Although a considerably higher traffic volume could be expected in model A as a result of induced traffic, the difference is only around 5 % compared to model B.

Seen in the light of a range of international studies estimating a 10 % capacity increase to result in 3-5 % short-term increase in traffic volumes (Duranton and Turner, 2011; Hansen and Huang, 1997; Litman and Colman, 2001; Noland and Lem, 2002; Strand et al., 2009), the results of model A appear to be in the low range of potential short-term traffic growth. After all, the new link will tie together a four lane motorway with a large redeveloped urban area, where the existing network requires traffic between these destinations to go through dense residential areas. However, in the Nordhavnsvej case, the congestion level is at the outset so high (close to capacity limits) that even a moderate additional traffic can cause substantial reduction in travel speeds. In such a situation, the so-called Braess' paradox may occur, where road capacity increase contributes to reduce overall travel speeds in the network instead of increasing them (Nielsen and Landex, 2005). Since the induced traffic reduces the improvement in travel speeds on Nordhavnsvej considerably, the road's ability to attract additional traffic increase will be constrained. The magnitude of induced traffic will therefore be lower than in a situation where there is considerable congestion but where the capacity increase is large enough to allow for all latent demand to be met without reaching capacity limits.

Table 1. Estimated Main Traffic-Related Impacts of the Proposed Nordhavnsvej, Based on Transport Model Forecasts With Induced Traffic Included (Model A) and Ignored (Model B). Source: Tetraplan (2011a).

Impact factor	Model A	Model B
AADT on main link	22,820	21,740
Total travel time savings (mil. DKK)	2,749	4,589
Changes in fuel consumption (tons)	483	-284
Changes in CO2 emissions (tons)	1,525	-897
Changes in noise level (weighted score[5])	167	162
Changes in safety (accidents involving personal injury)	-0.3	-1.2
Net present value (mil. DKK)	403	2,157
Internal rate of return (%)	5.6	8.1
Benefit ratio per invested capital unit	0.2	1.1

The increased traffic volume in model A results in higher estimates for all environmental cost categories than in model B, although the differences are fairly small compared to the total impact of these factors. An interesting observation is that model B gives the impression that CO2 emission levels will drop as a result of increasing capacity. When the effects of induced traffic are taken into account however, the increased emission levels as a result of higher traffic volumes show up correctly in the appraisal, and model A gives a picture that fits much better with the impacts we would expect for this type of project. A

[5] The weighted score is expressed as SBT (støjbelastningstal), which is a standard unit in Danish noise evaluations. A higher score indicates a higher noise level, although in this case the difference is fairly insignificant.

similar issue can be observed for traffic accidents, where the benefits calculated in model B are four times larger than in model A. While the absolute figures might appear small, the unit values for accidents are quite high, and the monetized impacts over the lifespan of the project measure in hundreds of millions.

It should be noted that the non-monetized values are only for the opening year of 2015, and that long-term effects must be expected to widen this gap – at least if further capacity increases are made allowing traffic to grow beyond the capacity limits soon reached after the initial road construction. In the simulation, traffic is expected to increase by an additional 10 % towards 2030, but from this point on the traffic level is considered static. Both of these assumptions could be expected to underestimate future traffic levels (at least unless policies to limit traffic growth are introduced, including non-expansion of road capacity), and the results of the appraisal must therefore be considered conservative. This becomes especially important when evaluating the travel time savings calculated on the basis of these traffic volumes, as benefits for the entire 50 year period used in the CBA are likely to be overestimated as a result (even in model A).

Even with all these reservations in mind it should be clear from the results in Table 1 that there is a significant reduction in benefits when the effects of induced traffic are taken into account. The results in Table 2 give a better understanding of why we observe reduced travel time savings when including the effects of induced traffic. In line with the underlying economic theory presented in section **Hata! Başvuru kaynağı bulunamadı.**, we observe positive travel time savings from additional drivers benefiting from the new capacity when we include induced traffic. These benefits correspond to area B in Figure 3. However, it is clearly evident from Table 2 that the benefits from these additional drivers are far too small to offset the loss of benefits to existing drivers, which corresponds to area C in Figure 3.

The above-mentioned effects are the results of quite elementary relationships between supply and demand, but they are often ignored in performance evaluations of demand forecasts. For example, Flyvbjerg, Holm and Buhl (2005) observe that while rail demand is typically greatly overestimated, the trend for road demand seems to be a slight underestimation. They therefore conclude that the problems associated with forecasting benefits are much greater for rail projects than for road projects, which also seem plausible when you only look at the actual traffic volumes. However, as the results of the present study clearly show, even slight underestimations of traffic volumes on roads can lead to quite significant benefit shortfalls within the CBA framework. In the Nordhavnsvej case a 5 % increase in traffic results in a time-savings loss of 40 %. Since these effects usually make up 80 % or more of the total benefits, this implies that actual benefits are less than 70 % of those expected from the CBA.

Table 2: Estimated Travel Time Savings from the Proposed Nordhavnsvej, Based on Transport Model Forecasts with Induced Traffic Included (Model A) and Ignored (Model B). Source: Tetraplan (2011a).

Travel time savings (hours per weekday)	Model A	Model B	Change
Cars			
Existing drivers	834	1282	448
New drivers	37	0	-37
Trucks			
Existing drivers	207	284	77
New drivers	6	0	-6
Travel time savings in congestion (hours per weekday)			
Cars			
Existing drivers	435	874	439
New drivers	16	0	-16
Trucks			
Existing drivers	85	163	78
New drivers	1	0	-1

As mentioned earlier, we have also carried out a simulation for a planned motorway in a less congested part of Copenhagen Metropolitan Area. In this case (the so-called Frederikssund motorway leading from one of the outer-area towns to the outskirts of the continuous urban area of Copenhagen), the percentage of traffic growth resulting from induced traffic was higher (around 10-11 %) than in the Nordhavnsvej case (5%). However, due to the much lower congestion level at the outset, the traffic increase in the Frederikssund motorway due to induced traffic would not bring congestion up to a level resulting in significant difference in travel time savings between the models with and without inclusion of induced traffic. Travel time savings were estimated to be 2.7% lower in the simulation with induced traffic than in the model where such traffic growth is ignored, and the benefits due to accident reductions were assessed to be 19% lower. Total travelers' benefits were estimated to be 3.5% lower in the model including induced traffic than in the model omitting induced traffic. (Tetraplan, 2011b).

Although the analysis of the Frederikssund motorway did not show significant congestion arising as a result of induced travel, the 10-11% increase in traffic obviously implies that the time at which the general, 'background' traffic growth causes the traffic volume to approach capacity limits will be shorter than in the absence of induced traffic. As mentioned earlier, only first-year benefits were calculated for the Frederikssund motorway case. Within a longer time horizon, say 15 years, the induced traffic might make up the increment making the difference between severe congestion and high capacity utilization still below capacity limits. With such a time horizon, the difference between the two models in travel time savings would probably have been more similar to that of the Nordhavnsvej case. Or conversely: additional lanes would have to be added several years earlier in order to maintain relatively free-flowing traffic than indicated by the model ignoring induced traffic (cf. also the Oslo example shown in Figure 2).

5. Discussion

The simulations for the Nordhavnsvej project illustrate the point made by Litman (2011) that a small amount of induced traffic can have a disproportionately large effect on the cost effectiveness of a road project. This is especially so in congested transport corridors, because of non-linear speed flow relationships and typically small net differences between large costs and large benefits. In such situations, underestimation of traffic demand resulting from failure to take induced traffic into account results in appraisals that, ceteris paribus, favor capacity expansion to a larger degree than if this effect is accounted for. The effect is especially crucial in the calculation of travel time savings, as the increased traffic volumes eat up much of the expected utility gains from capacity expansions. There might be a larger total number of drivers benefiting from the new capacity, but the benefit per driver is significantly reduced due to congestion forming much earlier than anticipated.

In the short term the extra traffic leads to benefit shortfalls in the form of longer travel times, which is problematic for the validity of appraisals (particularly CBAs). In the long term it leads to even further benefit shortfalls for time savings, but also severe underestimation of the adverse environmental effects of facilitating continued growth in urban vehicle traffic.

It is important to note that the issues raised in the present paper do not mean that there are no benefits to gain from expanding road capacity in congested urban areas, as more capacity will always offer some form of benefit for drivers. If nothing else, it creates the ability for more traffic to flow through the network. What we argue here is simply that the costs of providing this increased capacity are underestimated and the benefits exaggerated when traffic volumes are underestimated, by ignoring the loss of time savings and increased environmental costs.

Since future traffic volumes are usually estimated on the basis of trend extrapolation, the neglect of induced traffic might also cause an overestimation of demand in the case where no new capacity is added (Næss, 2011). The observed trends in traffic growth are themselves partly a result of prior capacity expansions, and a deliberate choice to abstain from this predict-and-provide approach is likely to result in lower traffic growth than in a business-as-usual scenario. By ignoring induced traffic the deterrent effects of congestion on future traffic growth for the zero-alternatives is thereby also ignored, and since these are the baseline with which different alternatives are compared, this causes further overestimation of benefits from capacity expansion.

6. Concluding remarks

The results presented show a significant overestimation of short-term benefits in appraisals that fail to account for induced demand. Long term effects must be expected to increase these errors exponentially. The faulty conclusions that decision-makers might derive from such appraisals can create a positive feedback loop of continued capacity expansions that do little to solve congestion in practice. Instead, such appraisals create an artificial demand for further capacity expansions, since the expansions themselves create much of the demand that is later extrapolated to reflect a 'natural' traffic growth for which capacity must be provided.

Although model-based forecasts, and the cost-benefit analyses in which they are used, do not influence decisions about project implementation in a one-to-one manner, a systematic overestimation of benefits and underestimation of adverse environmental effects generally tend to legitimize a high spending of society's resources on road construction. They also tend to delegitimize environmental opposition and disarm environmentalists of their arguments. Motorway construction can thus be supported by transport model forecasts by ignoring induced traffic, and it is sometimes portrayed as a suitable approach to reduce greenhouse gas emissions.

Due to the considerable difficulty in knowing beforehand how large the elasticity between road capacity increase and traffic growth will be in a particular transport corridor at a particular time, there is an inherent non-exactness of forecasts of differences between 'do something' and 'do nothing' (Næss and Strand, 2012). In cost-benefit analysis, uncertainty and controversy about how to assess the monetary value of travel time savings (Nicolaisen and Næss, 2011) as well as environmental impacts add to the overall uncertainty of the method. Cost-benefit analysis, which requires precise quantitative input, is therefore in our view not appropriate for assessing whether or not to build a proposed project of a particular category (e.g. a road project) in a specific geographic context. It may, however, be less inappropriate if the task is to compare different alternative ways of designing this project (e.g. layout A, layout B or layout C for a proposed new road). However, due to the uncertainty mentioned above, the CBA should then only be used to assess the marginal differences between different variants of the project, not its absolute economic value.

Given the problematic issues associated with current appraisal practice we argue that it would be more fruitful to pursue a more holistic appraisal approach with simpler, theory-informed models based on multiple scenarios for input variables and more comprehensive sensitivity analyses, rather than pretending to calculate the exact implications of projects.

Such a practice does not square well with the function of model-based traffic forecasts as quantified inputs to cost-benefit analyses in their current form, since this requires forecasts to be extremely accurate. But are forecasts really accurate enough to determine whether commuters will save e.g. 2.15 or 3.12 minutes on average from a new link? Many other public-sector branches use this evaluation method to a much lesser extent, based on the rationality that the effects cannot be quantified to a desirable degree. When cost-benefit methodology builds on such uncertain premises as displayed in the present article, decision-makers should at least take the results with a large grain of salt when considering conceptually different solutions (e.g. investing in road projects, public transport solutions, travel demand management initiatives, or doing nothing at all). If the decision relate to mere design choices of a project that is already decided, cost benefit analysis methodology is likely to be less problematic.

7. Acknowledgements:

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